Grand Canyon Monitoring and Research Center

FY 2002 Monitoring and Research Work Plans

- FORMAT FOR 2002 WORKPLANS (slides with project titles followed by single slide detail for each project)
- SCHEDULE OF BUDGET PROCESS
- 2001 CALENDER

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Schedule for Budget Process

- **8 Sept -**send slides to BOR for Sept 20-21 TWG meeting mail-out
- **20 Sept** – Present workplan to TWG
- **6 Oct –** Deadline for written comments from TWG representatives
- **27 Oct –** FY2002 draft detail workplan mailed to TWG includes response to comments table
- **7, 8 Nov-** Draft review and final comments from TWG, Recommendation to implement FY2002
- **8 Dec –** Final workplan mailed to AMWG incorporates Nov 7-8 comments.

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FORMAT FOR 2002 WORKPLANS

Project titles under each category (e.g., terrestrial ecosystem activities)

Individual project slides including objectives and estimated costs

- **Categories**
  - TERRESTRIAL ECOSYSTEM ACTIVIES
  - AQUATIC ECOSYSTEM ACTIVITIES
  - INTEGRATED ECOSYSTEM ACTIVITIES
  - REMOTE SENSING
  - MANAGEMENT AND BUDGET

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TERRESTRIAL ECOSYSTEM MONITORING ACTIVITIES

- ONGOING TERRESTRIAL ECOSYSTEM MONITORING
- ONGOING KANAB AMBERSNAIL MONITORING
- TERRESTRIAL MAPPING AND INVENTORY
- MAPPING HOLOCENE TERRACE DEPOSITS
- DATABASE PLAN
- MONITORING PLAN

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Terrestrial Ecosystem Monitoring (Continued from FY2001)

Objectives:

- Determine abundance and distribution changes in faunal constituents (vertebrates, invertebrates)
- Determine vegetation composition and structure associated with faunal components and distribution of culturally important botanical elements

PEP Recommendation: Expand sites and inventory /surveys need to be more inclusive

MO: See page 1 Table 1 (attachment)

Anticipated costs: Project: $261,000 (bio & cultural funds), Total: $330,400.

Deliverable: seasonal data incorporated into SCORE report

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Monitoring Kanab Ambersnail
(continued from FY2001)

OBJECTIVES:

- Measure Population Status of Snail at Vasey's Paradise
- Determine extent of habitat and habitat change using survey and digital camera methods.

PEP Recommendations: Reduce survey # and try less intrusive survey methods

MO's: See page 2 Table 1 (attachment)

ESTIMATED COSTS: Project: $10,000 complete through in-house and KAWG assistance. Total: $71,625

DELIVERABLES: Yearly population estimates updated in SCORE report, Habitat map of Vasey's paradise updated.

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Terrestrial Mapping and Inventory

OBJECTIVES

- Use 2000 Lidar/digital overflight to characterize habitat along corridor by community types
- Utilize to extend current terrestrial monitoring & inventory points
- Begin baseline for system-wide community change on 3-5 year basis.

PEP Recommendation: Develop system-wide GIS based habitat map

MO's: See page 2 Table 1 (attachment)

ESTIMATED COST: Project: $200,000 (from appropriated funds)

DELIVERABLE: GIS habitat base map for river corridor.

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Mapping HoloceneTerrace Deposits

(replaces Cultural Resource Monitoring and Mitigation Strategies, completed in FY 2001)

Objectives:

- Geomorphically define area potentially effected by dam operations (two year effort -FY 2002, 2003)

-Provide focal area for geomorphic process and linkages with dam operations and archaeological remains

-Provide spatial data to focus future treatment and monitoring efforts for cultural resources

-Implements geomorphic PEP recommendation

MO: Cultural 1 IN: 1.1

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Mapping HoloceneTerrace Deposits (continued)

Anticipated Costs: $ 100,000 contracted per year
(Estimated total costs - $163,000 per year)

Deliverable: Canyon wide map depicting locations of Holocene Terrace Deposits

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Data Base Plan

(replaces Development of Historic Context, completed in FY 2001)

Objectives:

- On-going project from FY 2001

-Consolidates Cultural Data at GCMRC for utilization in AMP efforts

- Implements PEP recommendation to consolidate data

MO: Cultural 4 IN: 4.1

Anticipated Costs: $ 25,000 (GCMRC); $25,000 (BOR)

(Estimated total GCMRC costs- $70, 100)

Deliverable: Continued consolidation of existing and new data for AMP and public dissemination, as appropriate

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Monitoring Plan

(reprogrammed Socio-cultural Protocol Implementation costs)

Objectives:

- Development of long-term monitoring plan in collaboration with Reclamation PA program

- Provides long-term guidance for GCMRC cultural efforts

-Provides greater coordination and efficiency between programs and overall AMP efforts

- Implements PEP recommendation

MO: Cultural 1 IN: 1.1

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Monitoring Plan

(continued)

Anticipated Costs: $ 25,000 (GCMRC); $ 25,000 (BOR)
(Estimated total GCMRC costs - $ 70,100)

Deliverable: Long term monitoring plan for PA program with guidance for GCMRC cultural program efforts

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Public Outreach Activities

Objectives:

- Continue on-going efforts for public outreach activities

- Implements PEP recommendation for increased Native American involvement and the AMP outreach recommendations for public information

- Complements GCMRC's overall public outreach

Anticipated Costs: $ 35,000 (Estimated total GCMRC costs - $ 60,000)

Deliverables: Presentations to disseminate cultural information; student internships, hosted workshops

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TERRESTRIAL ECOSYSTEM RESEARCH

Potential project: Carbon budget development

OBJECTIVES

-understand carbon linkages with aquatic system.

MO's: See page 3 Table 1 (attachment)

ESTIMATED COST: project $31,000; Total 55,900 logistics

DELIVERABLE: TBD

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AQUATIC ECOSYSTEM MONITORING ACTIVITIES

- LONG-TERM MONITORING OF PHYTO-BENTIC COMMUNITY
- LONG-TERM MONITORING OF DOWNSTREAM FISHERY
- ONGOING LONG-TERM MONITORING OF LEES FERRY TROUT
- INTEGRATED WATER QUALITY PROGRAM

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Aquatic Food Base Monitoring (New RFP for 2002)

- **OBJECTIVES**
  - Collect data on aquatic plant and benthic communities that support aquatic ecosystem. **Beginning of LTM**
  - Collect these data in a manner that characterizes the river corridor and detects changes in food base constituents
  - Begin to incorporate these values into a bioenergetic model for the aquatic ecosystem---what can this system sustain wrt fish numbers.

  PEP IN MARCH 2001

  MO's: see page 4 Table 1 (attachment)

  ESTIMATED COSTS: project $235,000; total: 261,840

  DELIVERABLES: Data linked to fish monitoring efforts provided on seasonal basis and contribute to SCORE report.

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Monitoring Fish Below Lees Ferry (New RFP for 2002)

- **OBJECTIVES**:
  - Collect data on fish populations that indicate status and trends of fish community. **Beginning of LTM**
  - Collect these data in a manner that characterizes the river corridor and detects changes in fish populations

PEP IN MARCH 2001

MO's: See page 5

ESTIMATED COSTS: project: 649,000 Total: **$**797,740

DELIVERABLE: Stock assessment report for each species of concern—(e.g., HBC, FMS, RBT, BRT) and data.

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Ongoing Monitoring Lees Ferry Trout (Continued from FY2001)

- **OBJECTIVES**
  - Collect data on fish populations that indicate status and trends of fish community in Lees Ferry. Began in 2001
  - Collect these data in a manner that characterizes the Glen Canyon Reach and detects changes in trout population.
  - Begin to incorporate these values into a bioenergetic model for the aquatic ecosystem---what can this system sustain wrt fish numbers?

MO's: See page 5 Table 1 (attachment)

ESTIMATED COSTS: project: $90,000 total: $149,840

DELIVERABLES: Stock assessment report for trout fishery, data delivery.

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Integrated Water Quality Program

OBJECTIVES

-Determine the effect of operation on reservoir and downstream biological, chemical and physical water quality constituents.

MO's: See page 6 Table 1 (attachment)

PEP TO TAKE PLACE IN 2000/2001

ESTIMATED COST: $396, 565 includes (O&M funds and AMP downstream activities, logistics)

DELIVERABLE: quarterly reports and data contributed to SCORE.

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FISHERY RESEARCH

- **POTENTIAL PROJECT**
  - Initiating bioenergetic model for Lees Ferry Fishery and downstream—provides feedback to terrestrial and aquatic monitoring

MO's: See page 7 Table 1 (attachment)

ESTIMATED COSTS: Project: $141,000 (AMP + appropriated funds); Total: $189,100

DELIVERABLES: TBD.

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INTEGRATED TERRESTRIAL AND AQUATIC ECOSYSTEM MONITORING

Continuing Projects: (Year 2 of 5)

- STREAMFLOW, QUALITY-OF-WATER AND FINE-SEDIMENT MASS-BALANCE
- SAND-STORAGE CHANGES IN THE MAIN-CHANNEL, EDDIES AND SHORELINES
- COARSE-GRAINED SEDIMENT INPUTS & IMPACTS ON PHYSICAL HABITATS

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STREAMFLOW, QUALITY-OF-WATER AND FINE-SEDIMENT MASS-BALANCE

OBJECTIVES: (Ongoing Measurements of…)

- Unit-values of discharge and fine-sediment transport of the Colorado, Paria and Little Colorado Rivers.
- Grain-size of channel-bed vs. suspended sand.
- Sand inputs vs. outputs for report on annual mass balance.
- Quality-of-Water at main-channel streamgage sites.

MO's: (see attached draft Table 1, p. 12-13)

PEP "SEDS" INPUT: "Track Fine-Sediment Mass Balance"

TOTAL ESTIMATED COSTS: Project **$**480,000; Total $549,140

DELIVERABLES: Stream flow, Water Quality and Suspended-Sediment data; annual report on status of fine-sediment mass balance with respect to Glen Canyon Dam operations.

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SAND-STORAGE CHANGES IN THE MAIN-CHANNEL, EDDIES AND SHORELINES

OBJECTIVES: (Ongoing Change Detection for…)

- Pre-dam river terraces and Post-dam beaches.
- Topography of near-shore aquatic and terrestrial substrates.
- Grain-size and volume of sand stored in the channel.
- Distribution of campsite sand bars in critical reaches.
- Channel-bed distribution of fine vs. coarse substrates.

MO's: (see attached draft Table 1, p. 8-11)

PEP "SEDS" INPUT: "Track Sand-Storage in Main Channel"

TOTAL ESTIMATED COSTS: Project $348,000; Total $435,740

DELIVERABLES: GIS topographic and sediment-distribution coverage for geomorphic reaches; annual change-detection report on status of main-channel sand storage.

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COARSE-GRAINED SEDIMENT INPUTS & IMPACTS ON PHYSICAL HABITATS

OBJECTIVES: (Ongoing Change Detection for…)

- Distribution and abundance of coarse substrates associated with biological habitats (fans, gravel bars, etc.).
- Quality of recreational campsites and navigational conditions in rapids.
- Conditions and potential for fine-sediment storage in pools and rapids.

MO's: (see attached draft Table 1, p. 14-15)

PEP "SEDS" INPUT: "Track Coarse-Sediment Mass Balance"

TOTAL ESTIMATED COSTS: Project **$**77,000; Total $113,40

DELIVERABLES: Sediment and topographic data from ungaged tributary debris flows; annual report on impacts of coarse-sediment inputs to river channel relative to Glen Canyon Dam operations.

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INTEGRATED TERRESTRIAL AND AQUATIC ECOSYSTEM RESEARCH

[Advanced Main Channel Modeling]

Continuing Project: (Year 2 of 2)

- CONCEPTUAL MODELING OF EVOLVING GEOMORPHIC FRAMEWORK

Continuing Two-Part Project: (Year 2 of 3)

- **a)** SIMULATING REACH-AVERAGED SAND BAR EVOLUTION;
  - **b)** ONE-DIMENSIONAL SAND-TRANSPORT MODEL DEVELOPMENT

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CONCEPTUAL MODELING OF EVOLVING GEOMORPHIC FRAMEWORK

OBJECTIVES: (Ongoing Model Development to…)

- Predict long-term physical-habitat changes (bars, pools, fans, shorelines) caused by debris flows under regulated operations.
- Advance understanding of coarse-sediment mass balance.
- Advance knowledge of relation between long-term trends of coarse-sediment balance and productivity.
- Focus future ecological research and long-term monitoring.

MO's: (see attached draft Table 1, p. 18)

PEP "SEDS" INPUT: "Track Coarse-Sediment Impacts"

TOTAL ESTIMATED COSTS: Project: **$**77,000; Total $99,500

DELIVERABLES: Geomorphic sub-model of main channel relating coarse-sediment mass balance to dam operations.

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PART A - SIMULATING REACH-AVERAGED SAND BAR EVOLUTION

OBJECTIVES: (Ongoing Model Simulations to…)

- Predict short-term responses of sand-bar evolution under a range of flow and sediment-supply conditions.
- Enhance knowledge of main channel flow and fine-sediment interactions.
- Evaluate timing and Magnitude of BHBF operations.
- Provide reach-averaged data for 1-D sand transport model.

MO's: (see attached draft Table 1, p. 15-16)

PEP "SEDS" INPUT: "Advance Sand-Bar Modeling"

TOTAL ESTIMATED COSTS: Project: **$**103,000; Total: $149,400

DELIVERABLES: Model output data and research report(s) on reach-averaged simulations of sand-bar evolution throughout Colorado River ecosystem.

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PART B - ONE-DIMENSIONAL SAND-TRANSPORT MODEL DEVELOPMENT

OBJECTIVES: (Ongoing Model Development to…)

- Predict the short-term fate of tributary sand inputs on daily to seasonal time scales.
- Enhance understanding of grain-size of inputs to residence time for sand storage in main channel environments.
- Increase knowledge of main channel flow and suspended-sediment interactions.

MO's: (see attached draft Table 1, p. 17)

PEP "SEDS" INPUT: "Advance Sand-Transport Modeling"

TOTAL ESTIMATED COSTS: Project: **$**102,000; Total: $124,500

DELIVERABLES: Model that predicts fate of sand inputs, and research report(s) on simulations of 1-D sand transport throughout Colorado River ecosystem, including exports.

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Information Technology Program

PROGRAM COMPONENTS:

- -Geographic Information System
- -Data Base Management System
- -Library
- -Survey Support
- -Remote Sensing Initiative
- -Systems Administration
- -World Wide Web Services
- -Aerial Photography

ESTIMATED COST: $835,000 (N/I salary)

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Geographic Information System (GIS)

OBJECTIVES:

- Service GIS map, data, and analysis request
- Integrate current year data into data systems
- Complete development of the Internet map server (IMS)
- Complete development of field mapping capabilities
- Complete integration of legacy base data
- Continue to provide GIS support to the remote sensing initiative
- Develop image classification and stereo mapping capabilities
- Migrate GIS data from INFO to oracle database

ESTIMATED COST: $58,000 (N/I salary)

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Data Base Management System

OBJECTIVES:

-Service data requests
-Integrate current year data into data system
-Administrate database
-Design and program data entry, analysis and web interfaces – fish, cultural, and water quality components completed
-Migrate historical data from legacy data systems - fish, cultural, and water quality components completed
-Document installation and administration procedures – completed for applications written to date

ESTIMATED COST: $45,000 (N/I salary)

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Library

OBJECTIVES:

-Service library requests
-Integrate current year data into library
-Complete cataloging library content
-Continue conversion of catalog (year 2 of 4)
-Continue making content available on-line
-Annual inventory

ESTIMATED COST: $18,000 (N/I salary)

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Survey Support

OBJECTIVES:

Service survey requests
Continue bathymetic base mapping (30 miles)
Continue development of control network (20 miles)
Continue to provide survey, control, and GPS support
to remote sensing initiative
Complete organizing legacy data

ESTIMATED COST: $35,000 (N/I salary)

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Remote Sensing Initiative

OBJECTIVES:

-Evaluate previous years results and test remaining technologies as needed

-Complete development of RS data collection protocols

-Report findings and recommendations

ESTIMATED COST: $400,000 (contract)

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Systems Administration

OBJECTIVES:

- Provide fault tolerant computer and network infrastructure
- Troubleshoot day to day computer problems
- Upgrade existing computing infrastructure
- Integrate new functionality

ESTIMATED COST: $111,000 (N/I salary)

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World Wide Web (WWW) Services

OBJECTIVES:

-Develop and maintain WWW services

More and better web content

More frequent updates

User friendly web interfaces

Easily navigatable web pages

Seamless integration of FTP content

ESTIMATED COST: $60,000 (contract)

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Aerial Photography

OBJECTIVE:

-Collect digital aerial imagery (<1 foot)

ESTIMATED COST: $100,000 (contract)